REMARKS

Claim 1 has been objected to for lacking sufficient antecedent basis.

Claims 1-7, 9, 11-13, and 16 have been rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 6,465,808 ("Lin") in view of U.S. Patent No. 6,573,527 ("Sugiyama").

Claims 10 and 15 have been rejected under 35 U.S.C. §103(a) as unpatentable over Lin and Sugiyama in view of U.S. Patent No. 6,673,254 ("Marshall").

Claims 17, 18, and 20-25 have been rejected under 35 U.S.C. §103(a) as unpatentable over Lin and Sugiyama in view of U.S. Patent Application Pub. No. 2001/0042866 ("Coman").

Claim 19 has been rejected under 35 U.S.C. §103(a) as unpatentable over Lin, Sugiyama, and Coman, and further in view of U.S. Patent No. 6,693,352 ("Huang").

Claim 26 has been rejected under 35 U.S.C. §103(a) as unpatentable over Lin in view of Marshall.

Claim 27 has been rejected under 35 U.S.C. §103(a) as unpatentable over Lin in view of Coman.

Status of Claims

Claims 8 and 14 have previously been canceled.

Claims 1-6, 9, 26, and 27 have been amended.

Claims 1-7, 9-13 and 15-27 remain pending.

Objection to claim 1

The Office Action states that claim 1 has been objected to because the element "contact layer" lacks sufficient antecedent basis. Claim 1 has been amended to refer only to the "patterned contact layer", for which a sufficient antecedent basis exists. Applicants submit that this rejection has now been overcome.

Summary of subject matter disclosed in the specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

A radiation-emitting semiconductor component is provided. The semiconductor component has a semiconductor body (1), which has an active zone (2), in which, for the purpose of electrical contact connection, a patterned contact layer (3) is applied on a surface of the semiconductor body (1). Interspaces (4) are distributed over the patterned contact layer (3) and are provided for the purpose of forming free areas (5) on the surface, which are not covered by the patterned contact layer (3). The free areas are covered with a mirror (6).

Descriptive summary of Lin

Lin discloses a method and structure for forming an electrode on a light emitting device. A transparent electrode or a reflective electrode is formed on a p-type gallium nitride-based compound semiconductor. The electrode includes opaque ohmic contact dots formed on the p-type gallium nitride-based compound semiconductor and a transparent conductive layer (or a

light reflective conductive layer) covering the p-type gallium nitride-based compound semiconductor.

Descriptive summary of Sugiyama

Sugiyama discloses a quantum semiconductor device that includes intermediate layers of a first semiconductor crystal that has a first lattice constant and is stacked repeatedly, and a plurality of quantum dots of a second semiconductor crystal that have a second lattice constant different from the first lattice constant. The quantum dots are dispersed in each of the intermediate layers and form a strained heteroepitaxial system with respect to the corresponding intermediate layer. Each of the quantum dots has a height substantially identical with a thickness of the corresponding intermediate layer.

Descriptive summary of Marshall

Marshall discloses methods for fabricating a highly effective micron-scale micro heat barrier structure and a process for manufacturing a micro heat barrier based on semiconductor and/or MEMS fabrication techniques. The micro heat barrier has an array of non-metallic, freestanding microsupports with a height less than 100 microns attached to a substrate. An infrared reflective membrane (e.g., 1 micron gold) can be supported by the array of microsupports to provide radiation shielding. The micro heat barrier can be evacuated to eliminate gas phase heat conduction and convection. Semi-isotropic, reactive ion plasma etching can be used to create a microspike having a cusp-like shape with a sharp, pointed tip (<0.1 micron), to minimize the tip's contact area. A heat source can be placed directly on the microspikes.

Descriptive summary of Coman

Coman discloses devices and techniques for fabricating InAlGaN light-emitting devices that result from the removal of light-emitting layers from the sapphire growth substrate. Various techniques for fabricating a vertical InAlGaN light-emitting diode structure that result in improved performance and or cost-effectiveness are described. Metal bonding, substrate liftoff, and a novel RIE device separation technique are employed to efficiently produce vertical GaN LEDs on a substrate chosen for its thermal conductivity and ease of fabrication.

Claims 1-7, 9, 11-13, and 16 are allowable over Lin and Sugiyama under 35 U.S.C. 103(a)

The Office Action states that Lin teaches all of Applicants' recited elements except "wherein the patterned contact layer has a thickness which is less than 100 nm", which Sugiyama allegedly teaches.

Applicants submit that the Examiner has misinterpreted the references and that Lin and Sugiyama, whether taken alone or in combination fail to teach or suggest "wherein the patterned contact layer has a thickness which is less than 100 nm", as recited in Applicants' independent claim 1.

Lin discloses a structured electrode (180) on a p-type GaN layer (160). The p-type GaN layer (160) of Lin is part of a semiconductor layer sequence (120, 130, 140, 150, 160) with the active layer (140). The electrode (180) of Lin is formed of a plurality of metallic opaque contact dots (182) covered by a transparent or reflective conductive layer (184) (see Figs. 4 and 5, and col. 4, lines 1-52 of Lin). The active layer (140) of the device of Lin can be formed as a quantum well structure (see col. 3, lines 46-52 of Lin). Moreover, as conceded by the Examiner, Lin fails

to teach or suggest "wherein the patterned contact layer has a thickness which is less than 100 nm", as recited in Applicants' independent claim 1.

Sugiyama discloses a quantum structure (3) that includes vertically aligned S-K mode quantum dots and quantum semiconductor devices that have such quantum well structures (see Fig. 1, col. 7, lines 16 to 17, and Figs. 15-20 of Sugiyama).

Figure 1 of Sugiyama shows a quantum structure (3) applied to a GaAs buffer layer (2) formed on a GaAs substrate (1), and not an LED, as asserted by the Examiner (see col. 7, lines 18-20 of Sugiyama). The quantum structure (3) of Sugiyama includes a plurality of GaAs intermediate layers (3a), wherein "each of the intermediate layers (3a) carries therein a plurality of quantum dots (islands) (3b) of InAs, wherein each of the quantum dots (3b) are isolated from other quantum dots (3b) in each of the intermediate layers (3a)" (see col. 7, lines 20-27 of Sugiyama). Further, according to Sugiyama, "it should be noted that the GaAs intermediate layer (3a) buries the islands (3b) of InAs ... Each of the islands (3a) ... forms a quantum dot that confines carriers therein three-dimensionally in combination with the intermediate layer (3a) (see col. 7, lines 38-45 of Sugiyama). Thus, Figure 1 of Sugiyama merely shows a semiconductor layer sequence that forms a quantum structure (3) that includes intermediate layers (3a) and islands (3b) that confine charge carriers. Therefore, it is clear that the intermediate layer (3a) and the islands (3b) of Sugiyama are not capable of providing any type of electrical contact connection at all, and therefore cannot be interpreted as a contact laver, thus making the thickness of the islands (3b) irrelevant with respect to Applicants' recited invention.

Further, the InAs islands (3b) of Sugiyama cannot be substituted for the metallic contact dots (182) of Lin. As shown in Fig. 15 of Sugiyama, the quantum well structure (26), which includes InAs islands (26b) and intermediate layers (26a), "forms the active layer of the light-

emitting diode (see Fig. 15, col. 11, line 54 to col. 12, line 2, and col. 12, lines 4-6 of Sugiyama). As for electrical contact connections, Sugiyama teaches that electrodes (31) and (32) are used for applying an electrical current to the active layer. However, Sugiyama fails to disclose the thickness of the electrodes (31) and (32). Thus, Sugiyama clearly fails to teach for suggest "wherein the patterned contact layer has a thickness which is less than 100 nm", as recited in Applicants' independent claim 1.

Moreover, combining the teaching of Lin and Sugiyama would only lead a person skilled in the art to modify the active layer (140) of Lin according to Sugiyama's quantum well structure (3). However, there is no teaching or suggestion in Sugiyama that would lead a person skilled in the art to pick the thickness of the carrier confining islands (3b) as an isolated feature, which is only related to a part of the active layer of the device of Sugiyama, and use it for modifying the electrode (180) of Lin. On the contrary, the combination of the teachings of Lin and Sugiyama as suggested by the Examiner is clearly improper as it is in clear contradiction to the disclosure of Sugiyama.

In view of the foregoing, Applicants submit that Lin and Sugiyama, whether taken alone or in combination, fail to teach or suggest "wherein the patterned contact layer has a thickness which is less than 100 nm", as recited in Applicants' independent claim 1. Accordingly, claim 1 is patentable over Lin and Sugiyama under 35 U.S.C. §103(a).

Dependent claims

Claims 2-7, 9, 11-13, and 16, which depend directly or indirectly from the independent claim 1, incorporate all of the limitations of claim 1 and are, therefore, deemed to be patentably

distinct over Lin and Sugiyama for at least those reasons discussed above with respect to independent claim 1.

Claims 10 and 15 are allowable over Lin, Sugiyama, and Marshall under 35 U.S.C. 103(a)

The Office Action states that the combination of Lin, Sugiyama, and Marshall teach all of Applicants' recited elements.

As previously discussed, Lin and Sugiyama do not teach or suggest the subject matter recited in Applicants' independent claim 1.

Because Lin and Sugiyama do not teach or suggest the subject matter recited in independent claim 1, and because Marshall does not teach or suggest the elements of claim 1 that Lin and Sugiyama are missing, the addition of Marshall to the reference combination does not remedy the non-obviousness of the claims.

Claims 10 and 15, which depend directly or indirectly from the independent claim 1, incorporate all of the limitations of claim 1 and are, therefore, deemed to be patentably distinct over Lin, Sugiyama, and Marshall for at least those reasons discussed above with respect to independent claim 1.

Claims 17, 18 and 20-25 are allowable over Lin, Sugiyama, and Coman under 35 U.S.C. 103(a)

The Office Action states that the combination of Lin, Sugiyama, and Coman teach all of Applicants' recited elements.

As previously discussed, Lin and Sugiyama do not teach or suggest the subject matter recited in Applicants' independent claim 1.

Because Lin and Sugiyama do not teach or suggest the subject matter recited in independent claim 1, and because Coman does not teach or suggest the elements of claim 1 that Lin and Sugiyama are missing, the addition of Coman to the reference combination does not remedy the non-obviousness of the claims.

Claims 17, 18 and 20-25, which depend directly or indirectly from the independent claim 1, incorporate all of the limitations of claim 1 and are, therefore, deemed to be patentably distinct over Lin, Sugiyama, and Coman for at least those reasons discussed above with respect to independent claim 1.

Claim 19 is allowable over Lin, Sugiyama, Coman and Huang under 35 U.S.C. 103(a)

The Office Action states that the combination of Lin, Sugiyama, Coman and Huang teach all of Applicants' recited elements.

As previously discussed, Lin, Sugiyama, and Coman do not teach or suggest the subject matter recited in Applicants' independent claim 1.

Because Lin, Sugiyama, and Coman do not teach or suggest the subject matter recited in independent claim 1, and because Huang does not teach or suggest the elements of claim 1 that Lin, Sugiyama, and Coman are missing, the addition of Huang to the reference combination does not remedy the non-obviousness of the claims.

Claim 19, which depends indirectly from the independent claim 1, incorporates all of the limitations of claim 1 and is, therefore, deemed to be patentably distinct over Lin, Sugiyama, Coman and Huang for at least those reasons discussed above with respect to independent claim 1.

Claim 26 is allowable over Lin and Marshall under 35 U.S.C. 103(a)

The Office Action states that the combination of Lin and Marshall teach all of Applicants' recited elements.

Applicants submit that the Examiner has misinterpreted the references and that Lin and Marshall, whether taken alone or in combination fail to teach for suggest "a patterned contact layer applied on a surface of the semiconductor body for electrical contact connection, wherein the patterned contact layer comprises contact elements that are separated from one another, and wherein the contact elements have the form of cylinders", as recited in Applicants' independent claim 26.

Lin discloses a structured electrode (180) that is formed of a plurality of metallic opaque contact dots (182). The object of Lin is to provide a device which has "contact dots which are in perfect ohmic contact with the p-type GaN layer 160" (see col. 4, lines 14-16 of Lin). This implies that there is a high thermal conductivity provided between the contact dots of Lin and the GaN layer (160). Further, the number of contact dots (182) of Lin must be sufficiently high so that "the current is uniformly spread to the p-type GaN (160) and the light intensity is hence enhanced. Also, the reliability of the light emitting device is improved"(see col. 4, lines 39-41 of Lin).

Marshall, on the other hand, discloses non-metallic microposts (14) made of poor thermal conductors, such as silicon, germanium, or gallium arsenide so that "thermal conduction through the support is minimized" (see col. 4, lines 39-40 and lines 43-44 of Marshall). Further, and as acknowledged by the Examiner, the microposts of Marshall are of cylindrical shape to minimize the total number of contact elements per unit area to the reflective layer.

Because Lin teaches making the number of contact dots (182) sufficiently high to provide

uniform current spread, and Marshall teaches minimizing the number of microposts to minimize the thermal conductivity as much as possible, the teachings of Lin explicitly contradict the teachings of Marshall. Thus, a person skilled in the art would not be motivated to use the shape of the microposts of Marshall for the shape of the contact dots of Lin since the microposts of Marshall and the contact dots of Lin serve entirely different and contradictory functions.

In view of the foregoing, Applicants submit that Lin and Marshall, whether taken alone or in combination, fail to teach or suggest the subject matter recited in Applicants' independent claim 26. Accordingly, claim 26 is patentable over Lin and Marshall under 35 U.S.C. §103(a).

Claim 27 is allowable over Lin and Coman under 35 U.S.C. 103(a)

The Office Action states that Lin discloses all of Applicants' recited elements except for the feature that the interspaces are filled with a filler in order to at least planarize the surface of the patterned contact layer, which feature Coman allegedly teaches.

Applicants submit that the Examiner has misinterpreted the references and that Lin and Coman, whether taken alone or in combination fail to teach for suggest "wherein the interspaces are filled with a filler in order to at least partially planarize the surface of the patterned contact layer", as recited in Applicants' independent claim 27.

The Examiner cites Fig. 3, element (26a), and paragraph [0006] of Coman as teaching "a light emitting device that contains a filler which contains a transparent and electrically conductive material", and that "the filler is a transparent and electrically conductive material to produce a highly reflective mirror".

Nowhere in paragraph [0006] of Coman is it taught or suggested that "the interspaces are filled with a filler in order to at least partially planarize the surface of the patterned contact

layer", as recited in Applicants' claim 27. Further, element 26a in Fig 3 of Coman is described as a mirror (see paragraph [0023] of Coman).

In view of the foregoing, Applicants submit that Lin and Coman, whether taken alone or in combination, fail to teach or suggest the subject matter recited in Applicants' independent claim 27. Accordingly, claim 27 is patentable over Lin and Coman under 35 U.S.C. §103(a).

Conclusion

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of all outstanding rejections, and the allowance of all pending claims, in due course.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is invited to telephone the undersigned in order to facilitate an early resolution of any outstanding issues.

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